Art. XXIII.—*On a Discovery for Determining Danger of Collision in Vessels Crossing one another's Track.*

Paper contributed by Capt. C. J. Perry.

[Read by Professor Halford, Nov. 11th, 1867.]

Mr. President,

Sir,—Seven years have elapsed since the writer of this paper had the honour of presenting an illustrated treatise "On Collisions at Sea," to this Society, and on page 18 of that work may be seen the author's justification for publishing a discovery of very high importance to every maritime state in the world, in so limited a manner, as by proffering a newly invented instrument for preventing collisions. But, of course, the instrument gave effect to the newly discovered principle, and the inventor naturally supposed that that principle would be at once seen, and either approved or condemned immediately the instrument should be exhibited in public; but such has not been the case. And although the inventor further announced the discovery in the treatise (p. 18), by saying: "The process of science is invariably of "a two-fold character, she first of all discovers a law or "governing principle by which the operation may be con-"trolled, and then constructs an instrument which shall give "effect to that discovery." Yet, strange to say, no one has perceived it, probably because the thing seemed altogether incredible. For since during the whole history of navigation no nautical writer has ever ventured to propose a means within the reach of seamen of knowing when the danger of collision is involved in the courses of two approaching ships, it no doubt seemed too much to believe that a mere consideration of the collision of the "Lady Bird" and "Champion" off Cape Otway, should lead to a discovery of such means by a humble individual in the colony of Victoria.

Again, a person has only to consider the almost unlimited diversity in the angle and speed at which ships cross one another's track, and above all, the uncertainty which always prevails on these points in the mind of the seaman in order to understand the apparent improbability of there being any mathematical principle in existence, which, in spite of such seemingly insuperable difficulties, should be *uniformly* and *reliably* applicable to every possible case. No wonder then that the discovery of such a principle was so far beyond the expectations of scientific men, as well as the nautical community generally, as to cause the announcement of it to be looked upon as a mere chimera. No wonder if the discovery remains in abeyance for seven years without a single individual to come forward to say whether it be a reality or not. Still, the discovery is not any the less true, nor any the less important because it has been so long disregarded, and now we proceed to explain it.

In looking into the official statistical records in England, the writer was astonished to find that the number of collisions on the coasts of Great Britain, always increases in proportion to the means taken to prevent them; that they are always far more numerous when the weather is clear and the legally prescribed precautionary system of lights most fully developed. He observed that the same remarkable fact applied to the cases of collision on the coasts of Australia. This unwelcome truth presented itself to the Board of Trade in the most convincing manner, but they naturally did not like to dwell upon it; for, in the first place, it seemed to reflect upon the system they were strictly enforcing, and in the next place, no other resource whatever was within their reach. In the "Wreck Return," published by the Board in the *Nautical Magazine* of Nov. 1857, the true state of things was shown in the two following items, extracted from the table of casualties:

Collisions.	In the day time.	In the night time.
In thick and foggy weather	5	19
In clear weather	36	81

This comparative statement is very significant, for it proves that those cases which no human foresight could provide against are by far the fewest, and that the most numerous are those which occur when the weather admits of the fullest development of our supposed safeguards, the signal lights. The writer therefore concluded that the common procedure followed by seamen with respect to collisions, operated deceptively, and that a latent error of a very insidious and dangerous character pervaded it; he consequently searched for that error and found it. He found that it was of so delusive a character that the ships of all nations had for ages actually reversed the true indications of safety and danger, and that no writer on navigation, whose works are extant, had ever detected and exposed the error; he further perceived that through the universal adoption of the error, the causes assigned for collisions by boards of inquiry are very seldom the true ones.

Now, perhaps the best mode of disclosing the error in question and showing how generally it prevails, will be by pointing it out in the case of the late collision between the steam-ships "City of Launceston" and "Penola" as it was presented and adjudicated in the Supreme Court. The testimony given by the captain of the "City of Launceston" and all his officers was concise and clear; it went to show that they sighted the "Penola" two and a-half points on the starboard bow, at a distance of about five miles, and that after pursuing their course until the distance was diminished to about two and a-half miles, the captain made a second observation of the "Penola," and found that she was on the same "bearing," viz., two and a-half points on the bow, as when first sighted, and in consequence of observing this *continuance* of the angle, he, influenced by the common belief in such cases, concluded that the vessels would pass a long way off from one another, he therefore confidently held on his course at full speed, and now positively declares that no collision could possibly have happened unless the other vessel had improperly altered her course after the second observation had been made, which, as he alleges, showed the ships to be pursuing perfectly safe courses. Now we shall show that this captain acted precisely wrong, yet his conduct was fully approved by the Court, the experts, and the jury, and a verdict was given him accordingly, and there can be no disrespect in saying (because it is a simple fact), that both the nautical and legal professions are very much in the dark with respect to the true indications of safety and danger in a case of impending collision. The mathematical principle discovered by the writer to be available as a preventive of collisions if brought to bear on the case we have been noticing, would at once show that the common practice of "keeping" an approaching ship upon whatever angle she may happen to be on, as a means of safety and the commonly received theory that such a practice is a right one, are altogether delusive, and that the continuance of an approaching vessel upon any angle whatever, however "broad" on the bow it may be, is so far from being a criterion of safety, that it is emphatically the very index of danger. It proves therefore that in some respects our present practice with regard to collisions systematically reverses the true indications of safety, and danger blindly chooses a procedure which *creates* disasters, and then triumphantly ascribes them to a wrong cause. No wonder, then, if the number of disasters is diminished by three-fourths, when the weather is so thick and foggy as to prevent the natural courses of the ships being meddled with. And now we come to speak of the discovery itself, and to illustrate it with a diagram which we conceive will satisfactorily establish all that has been written on the subject, both in the treatise and in this paper.

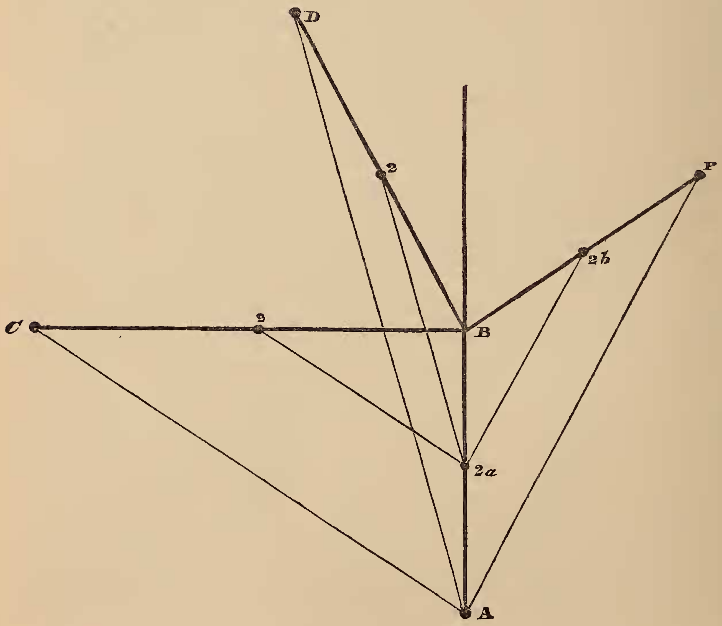
The writer discovered that a grand yet sublimely simple mathematical principle, easily distinguishable, always developes itself in every case in which the danger of collision is involved in the courses of two approaching ships, and that the principle never can be developed unless that danger exists, so that being once known, it can never mislead, and the principle itself may be thus stated :

" Whenever the danger of collision pervades the courses of "two approaching ships, each vessel maintains unalterably " one line of direction, or ' bearing,' from the other through- " out the progress of the ships towards the point of contact," so that if the light of an approaching ship in the night time is seen, after a moderate interval of time, to continue on the same " bearing" as was first observed, as in the case of the "Penola" and " City of Launceston," it is a certain indieation that the danger of collision is involved in the courses of the ships ; but if the second observation shows the approaching ship to be upon a smaller angle with the course than that which was at first observed, it indicates that she will pass "ahead ; but if upon a larger angle, that she will pass "astern ;" any alteration therefore in the angle or "bearing" is a sign of safety ; but a continuance of the same angle, whether it be two, three, four or five points on the bow, is an infallible token of danger, as the accompanying illustrative diagram clearly proves :—

Illustrative Diagram by C. J. Perry.

To prove that whenever the danger of Collision pervades the courses of two approaching ships, each vessel maintains unalterably one line of direction, or bearing from the other throughout every stage of their progress towards the point of contact.

Let A represent a ship when she sights the lights of three other vessels in various directions, and at different distances, as at the positions C, D, P, the thin lines shewing their bearings from A. And let it be assumed that all the vessels are steering along the lines connecting them with the point B, at which they will all arrive at the same moment, and therefore come into collision with A. It follows then, that as the different distances from B are run by the ships in the same space of time, when the ship A has run any portion of her distance, say a fifth, a third, a half, and so on, all the other vessels will have attained a precisely similar proportion of theirs. Now, if lines be drawn from any point on A's track where the ship may happen to be, say at 2*a*, to the corresponding points on the tracks of the other vessels, which are at 2, 2, 2*b*, they will be found to be parallel with the lines of the first "bearings," and therefore upon the same angles with the course of A as the vessels were observed to be on when first sighted at the positions C, D, P. The problem to the right, illustrates the case of the "City of Launceston" and "Penola."



A. First position, "City of Launceston."
P. First position, "Penola."
2*a*. Second position, "City of Launceston."
2*b*. Second position, "Penola."